Jan. 30, 1945. J. W. WRIGHT 2,368,340

FIRE EXTINGUISHER

Filed Dec. 18, 1941

Fig. 1

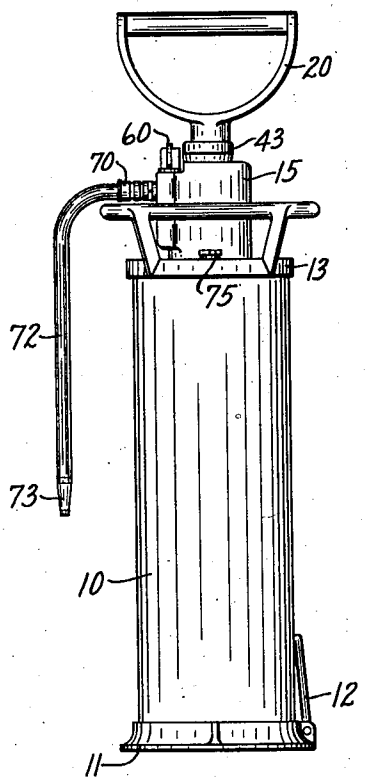


Fig. 2

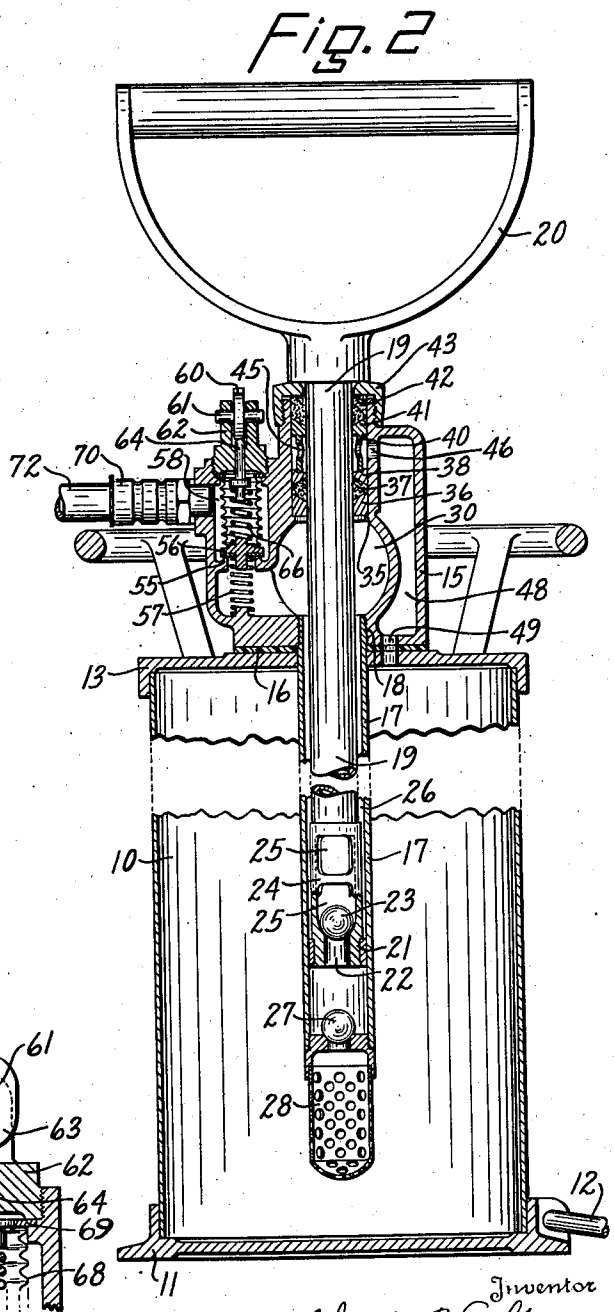
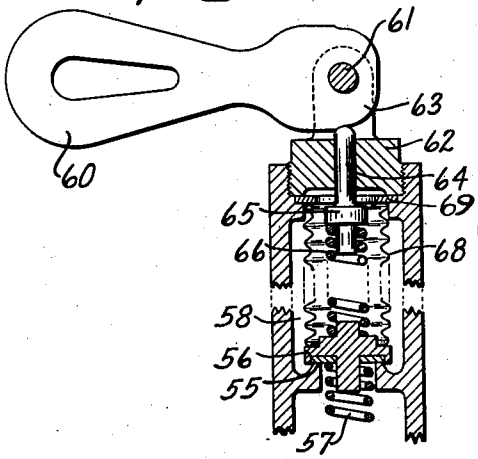


Fig. 3



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Patented Jan. 30, 1945

2,368,340

UNITED STATES PATENT OFFICE

2,368,340

FIRE EXTINGUISHER

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Application December 18, 1941, Serial No. 423,510

5 Claims. (Cl. 299—96)

This invention relates to fire extinguishers and more particularly to fire extinguishers adapted for use in extremely low temperatures.

Certain types of commercially available fire extinguishers are specially constructed for low temperature operation but even with such extinguishers, it is found that their operation either becomes unsatisfactory and unreliable or ceases entirely when the temperature to which they are exposed drops to the range about —45° C. (—49° F.) and below. At temperatures of this order, extinguishers of the vaporizing-liquid type may become inoperative due to freezing of the solution if such devices are filled with the ordinary carbon tetrachloride base fluid or due to the freezing of moisture condensed from the air on the operating mechanism. Extinguishers of the acid-reaction type are ineffective at these temperatures due to the feeble chemical reaction which occurs in such devices at low temperatures. In the case of extinguishers of the compressed gas operated type, if the extinguisher is operated by compressed carbon dioxide gas the vapor pressure of this material at —45° C. is so low that insufficient pressure can be obtained within the extinguisher to cause an effective discharge of the contents. Where other compressed gases, such as nitrogen, are used in sufficient quantity to cause an effective discharge at this low temperature, an abnormally high pressure will be generated within the container when the device is operated at room temperature at high summer temperatures, a pressure which may be sufficient to cause danger of rupture of the extinguisher container.

It is therefore one of the principal objects of this invention to provide a fire extinguisher which is adapted to operate reliably and effectively over a wide range of temperatures from an extremely low temperature up to the temperatures encountered in hot summer conditions.

Another object of the invention is to provide a fire extinguisher in which the operating mechanism is protected against condensation or collection of moisture thereon so that the extinguisher remains at all times in condition to operate efficiently over a wide range of temperatures.

A further object of this invention is to provide a fire extinguisher having a shut-off valve of such construction that it will be and remain operable at the lowest temperatures at which the extinguisher may be used, in which condensation of moisture even if present will not interfere with the operation, and which at all times may be promptly and easily actuated to closed or open position.

Another object of this invention is to provide an extinguisher fluid suitable for use in an extinguisher capable of efficient operation throughout a wide temperature range from high summer temperature to extremely low temperatures which fluid will not freeze when exposed to extremely low temperatures for long periods of time.

Still another object of this invention is to provide an extinguisher simple in construction, having relatively few moving parts, and of sufficiently rugged construction that it may be used under extremely adverse conditions.

In the drawing which discloses a preferred embodiment of the invention,

Fig. 1 is an elevational view of an extinguisher constructed in accordance with this invention;

Fig. 2 is a vertical sectional view of the extinguisher on a larger scale taken through the axis of the outlet valve, certain parts being broken away to more clearly show the construction; and

Fig. 3 is a partial sectional view through the outlet valve actuating lever on a still larger scale.

As shown, the extinguisher consists of a cylindrical container 10 having the bottom cover 11 with a suitable foot-rest 12 and a top cover 13, the two end pieces being suitably fastened to the cylindrical side wall by soldering, welding, or other suitable means. Attached to the cover 13 is a fitting 15, held in place thereon by bolts or the like and sealed by means of gasket 16. Pump cylinder 17 is threadedly carried by such fitting as shown at 18, supporting the pump cylinder generally vertically within the cylindrical casing 10. Preferably a liquid pump is provided, having a tubular piston rod 19 closed at its upper end where it is secured to the operating handle 20. The piston rod extends through the fitting and into the interior of the casing 10 where it is provided with a pump plunger 21, which is centrally apertured as shown at 22 to provide a passage leading to the check-valve 23. The lower end of the piston rod carries the valve seat member 24 in which the apertures 25 are formed to provide a path for the flow of the liquid in the operation of the pump into the annular space 26 between the piston rod and the pump cylinder 17.

A cooperating check-valve 27 is carried at the lower end of the pump cylinder and a perforate shield 28 is provided in position extending downwardly below the pump cylinder but spaced somewhat above the bottom of the casing to avoid any

possibility of picking up slush, foreign matter, or the like during operation. The total area of the perforations in member 28 is preferably in excess of the area of the passages through the two check-valves so that a free inward flow of fluid is provided for at all times.

In the operation of the pump, as will be clearly understood, upon reciprocation of the pump handle 20, fluid is delivered under pressure during each upward and downward stroke, into the annular space 26 from which it is delivered into the globular area 30 formed in fitting 15. Some air becomes trapped in the upper portion of this space and in the hollow piston rod above the valve seat member 24 and thereby serves as a cushioning medium to provide for more even flow in the outward discharge of the fire extinguishing fluid.

Because it is necessary to adequately protect the pump during operation against access of moisture thereto, which at the very low temperatures for which the pump is adapted might result in making it impossible to properly operate the pump, means are provided for assuring that should any moisture collect by condensation or otherwise, it will not be in such location that it can impair the proper operation of the extinguisher. For this purpose a shoulder 35 is formed within the inner portion of fitting 15 against which there is seated a lower gland member 36. Suitable packing 37 is received between the lower gland and an upper gland 38. Spaced above the lower packing is an upper packing supported from gland 38 which has a seat to receive a cylindrical flange 40 formed on a gland member 41. Upper packing material 42 is received between gland 41 and an outer gland nut 43 which is suitably threaded onto an upwardly projecting neck portion of fitting 15. When nut 43 is tightened, it effects compression of both the outer packing 42 and inner packing 37, the shape of the gland surfaces being such that the packings are forced into close sealing contact with the piston rod. Outer packing 42 when placed in use is thoroughly saturated with a light mineral oil, such for example as kerosene or other suitable oil having a freezing point sufficiently below the temperature to which the extinguisher may be subjected to assure that it will remain fluid at all times.

Flange 40 is located intermediate the wall of fitting 15 and the piston rod and is provided with a series of apertures 45 which communicate with other apertures 46 formed in the interior wall of fitting 15, thereby providing a path communicating from the space around the piston rod and between the two packings, into the passage 48 formed in the fitting 15 but located exteriorly of the discharge space 30 and hence not subject to discharge pressure. Ports 49 are formed in the lower wall of the fitting 15 and the end cover 13 to provide for communication between this passage 48 and the interior of the casing 10.

In operation, as the piston is reciprocated, the flued is subjected to discharge pressure and flows into the globular section 30. Such fluid as may leak along the piston rod and through packing 37 will collect in the space between the packing 37 and the upper packing 42, and will be discharged back through apertures 40, 46, passage 48, and aperture 49 into the main body so that no fluid will be lost. The air necessary to replace the discharged fluid will be drawn inwardly through the outer packing 42, the oil contained therein saturating the interstices in the packing and preventing the deposit of any material quantity of moisture in the packing as by condensation or otherwise which might result in making the packing hard and ineffective or in freezing the piston rod in place. If any small quantity of moisture is left in the packing, it is distributed and dispersed through the oil and even upon freezing does not render the packing stiff or impair its effectiveness. The path for the supply of the air into the casing is the same as that described for the leakage liquid, the air further serving to facilitate the return of the liquid as it flows back into the casing.

A shut-off valve is provided for controlling the discharge of the fluid from the extinguisher, such shut-off valve being located within an extended portion of fitting 15. As shown, the fitting is formed to provide an upwardly extending valve seat 55, the valve member 56 being adapted to close upon the seat to prevent discharge of the fluid. A spring 57 located below the valve 56 provides for normally urging the valve to raised or open position, permitting the discharge of the fluid from the globular portion 30 into the discharge chamber 58 formed above the valve.

Actuation of the valve is controlled from an external manually operable lever 60, pivotally mounted on pin 61 carried in a threaded cap portion 62 adapted to be received within a seat formed above discharge chamber 58. Lever 60 carries a cam portion 63 which is adapted to engage and effect downward movement of an operating pin 64 having a collar 65 thereon to limit its upward travel, and also forming a shoulder for engagement with resilient means 66. Such resilient means engages the valve at its lower end, and upon the turning of hand lever 60 to the position shown in Fig. 3, pin 64 is actuated to its lowermost position in which pressure is applied to the upper end of spring 66, to be transmitted therethrough to the valve member, and to urge said valve member into a yieldably held closed position, overcoming the counter action of spring 57.

In order to assure that the valve parts will remain operative under all conditions of use and in the extremely low temperature range desired, means are provided for completely preventing communication between the valve actuating parts and the interior of the casing, thereby preventing passage of moisture into the cylinder and sealing the operating mechanism effectively so that no collection of moisture can occur with resultant freezing of the valve parts.

For this purpose, a flexible bellows-like member or Sylphon 68 is provided, the upper end thereof being secured in sealed relation by soldering or the like to a soft copper washer 69 held between the bottom of valve nut 62 and its seat in fitting 15. The lower end of member 68 is fastened, as by soldering, in sealed relation to a flanged seat on the upper side of valve member 56. The arrangement is such that while the upper end of the bellows-like member is held in fixed relationship with the wall of the chamber, the lower end can move with the valve, the whole bellows expanding and contracting as necessary to provide for such movement while maintaining the sealed relationship. When expanded and with the valve closed, access of moisture from either the discharge outlet or from the space surrounding the operating pin 64, is completely prevented, and any discharge or leakage of fluid from inside the extinguisher is also prevented. When, however, handle 60 is rotated to its upright position, the pressure is removed from pin 64, releasing spring 66, and spring 57 then effects the raising of the valve with corresponding col-

lapsing movement of bellows 68. In this position the discharge path is open, and the fluid is discharged under the pumping action past the valve seat, and into the discharge chamber 58. In this construction clearance is preferably provided between pin 64 and the aperture in valve nut 62 through which it passes since it is not possible for any leakage to take place. Also a quantity of lubricant can be supplied to the pin and in the interior of the bellows member to assure smooth and continued operation of the pin and such lubricant will be maintained effective and out of contact with the fire extinguisher fluid. Thus the possibility of the entrance of moisture at the valve is greatly reduced and if present its effect would not be objectionable or result in impairing the operation of the valve.

An outlet fitting 70 communicates with the discharge chamber 58, and to the fitting is attached a flexible hose 72 provided with a discharge nozzle 73.

A suitable fluid is provided, which may be introduced into the casing through a filling opening such as that shown at 75, in the form of a threaded cap nut positioned in the top cover 13. It is highly important to provide a fluid which will not develop excessive vapor pressure at even the high summer temperatures that may be encountered, such as up to 50° C. (122° F.), and which will likewise not freeze or become so thick as to make it difficult to handle, at the very low temperature range desired, of the order of —45° C. and below. A suitable fluid for this purpose, and one which is found to remain substantially inert in the usual construction of extinguisher parts has been found to be one comprising a mixture or carbon tetrachloride and trichlorethylene. A mixture of these materials may be formed comprising a major portion of the carbon tetrachloride and a minor proportion by volume of the trichlorethylene, and is found to be an efficient fire extinguishing medium with a freezing point below —65° C. Specifically, the preferred composition comprises seven parts by volume of carbon tetrachloride to three parts by volume of trichlorethylene. An extinguisher constructed in accordance with the present invention and containing a charge of this character has been successfully operated at temperatures as low as —65° C., with entirely satisfactory results.

While the foregoing description has been directed to preferred embodiments of the invention, it is to be understood that the invention is not limited to the embodiments so described, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. In a fire extinguisher of the character described adapted for operation at low temperatures, an extinguisher casing for receiving a quantity of fire extinguishing liquid, a liquid pump for subjecting said liquid to pressure, a fitting extending from one end of said casing and fastened thereto providing for the mounting of said pump thereon, said pump having a piston rod extending outwardly through said fitting, a plurality of packing means carried by said fitting and located in spaced relation with each other along said piston rod, the outermost said packing being saturated with a light non-freezing oily material filling the interstices in said packing and preventing the collecting and freezing of substantial quantities of moisture therein, said fitting being formed intermediate said packings with an aperture providing a passage for the inflow of air and the return of any leakage fluid, and a return passage into the interior of said casing formed in said fitting exteriorly of the discharge passage therethrough.

2. In a fire extinguisher of the character described adapted for operation at low temperatures, an extinguisher casing for receiving a quantity of fire extinguishing liquid, a liquid pump for subjecting said liquid to pressure, a fitting extending from one end of said casing and fastened thereto providing for the mounting of said pump thereon, said pump having a piston rod extending outwardly through said fitting, a plurality of packing means carried by said fitting and located in spaced relation with each other along said piston rod, the outermost said packing being saturated with a light non-freezing oily material filling the interstices in said packing and preventing the collecting and freezing of substantial quantities of moisture therein, said fitting being formed intermediate said packings with an aperture providing a passage for the in-flow of air and the return of any leakage fluid, a return passage into the interior of said casing formed in said fitting exteriorly of the discharge passage therethrough, said fitting being formed to provide an outlet for discharging the fluid from said casing, a shut-off valve in said outlet, means operable from outside said fitting and having a part extending thereinto for actuating said shut-off valve, and means for enclosing and sealing said actuating part to prevent communication between said part and the fluid being discharged.

3. In a fire extinguisher of the character described adapted for operation at low temperatures, an extinguisher casing for receiving a quantity of fire extinguishing liquid, said casing having a return flow opening in the upper part thereof, a liquid pump for subjecting said liquid to pressure to discharge the same, a fitting extending from one end of said casing and fastened thereto providing for the mounting of said pump thereon, said pump having a piston rod extending outwardly through said fitting, means including an inner wall in said fitting forming a chamber above said pump for the discharge of the liquid under pressure, packing means surrounding said piston rod carried by said fitting and located above said discharge chamber, said packing being saturated with a light non-freezing oily material filling the interstices therein and preventing the collecting and freezing of substantial quantities of moisture therein, and an outer wall on said fitting defining with said inner wall thereof a return flow passage extending from above said packing to said return flow opening to provide for the return flow into said casing of any liquid leaking past said packing.

4. In a fire extinguisher of the character described adapted for operation at low temperature having an extinguisher casing for receiving a quantity of fire extinguishing liquid and a pump for subjecting said liquid to pressure, the combination of an outlet fitting in communication with said casing for discharging the liquid therefrom, a shut-off valve in said outlet fitting, an operating pin extending into said fitting from the exterior thereof and into the path of the liquid discharge, said pin being mounted in said outlet fitting for longitudinal sliding movement, resilient means actuated upon said movement of said operating pin for effecting the closing of said shut-off valve, sealing means for enclosing said resilient means and said operating pin prevent-

ing, communication between said parts and the liquid being discharged from the casing, and means accessible from outside said casing and cooperating with said operating pin providing for longitudinal sliding of said pin over a substantial range of travel with corresponding movement of said valve between its open and its closed positions.

5. In a fire extinguisher of the character described adapted for operation at low temperatures having an extinguisher casing for receiving a quantity of fire extinguishing liquid and a pump for subjecting said liquid to pressure, the combination of an outlet fitting for discharging the liquid from said casing, a shut-off valve in said outlet fitting, a seat with which said valve cooperates to prevent liquid discharge, spring means for lifting said shut-off valve from said seat, an operating pin extending into said fitting for effecting actuation of said valve, said pin being mounted in said fitting for longitudinal sliding movement, means outside said fitting operable for releasing said pin to provide for opening of said valve, resilient means within said fitting in the path of discharge of said fluid for transmitting the movement of said pin to said valve to close and seat the same against the action of said spring means, and means for enclosing and sealing said operating pin and its associated resilient means to prevent communication between said parts and said extinguishing liquid.

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